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Nekotorye dannye po biologii moivy zapadnogo poberezh'ya Kamchatki

Some data on the biology of the capelin (*Mallotus villosus* O. F. Miller) off the western coast of Kamchatka

E. A. Savicheva

The Far Eastern or Pacific capelin, *Mallotus villosus socialis* (Pallas), is a marine, bentho-pelagic fish of the smelt family. The capelin in the Far East has been poorly studied. There are data in the literature on the biology of the capelin in the Sea of Japan (Rumyantsev, 1946) and on the fecundity of capelin in the south-eastern part of the Bering Sea (Fadeev, 1970).

The capelin is widely distributed (Rumyantsev, 1946) in the waters of the northern part of the Atlantic and Pacific Oceans, as well as in the Arctic Ocean, with the exception of the region from Novaya Zemlya to the Bering Strait. It is encountered in considerable numbers off the coasts of Norway, Novaya Zemlya, Iceland, Greenland, Labrador, Newfoundland, and off the coasts of Alaska, British Columbia, the Aleutian Islands, the Chukchi peninsula, Kamchatka, along the coast of the Sea of Okhotsk, off the shores of Sakhalin, along the northern coast of Hokkaido Island, off the coast of the Primorye Territory and north-eastern Korea.

Lying at the basis of the study presented here is material that was collected in the Sea of Okhotsk, in the Kirovskii fishery combine in June of 1971 during the spawning of the capelin. The samples were collected from catches in trap nets. The treatment of the material was carried out according to the generally accepted methods, that have been presented by I. F. Pravdin (1966) in his "Handbook for the study of fishes". The age of the capelin was determined on the basis of the otoliths.

The absolute length of the measured individuals ranged from 13.4 to 17.7 cm for the males, and from 12.2 to 16.9 cm for the females. Among the males there was a predominance of individuals with a length of 15.0 - 16.0 cm, with an average of 15.2 cm, while among the females individuals with a length of 13.0 - 14.0 cm predominated, with an average of 13.5 cm. The maximal length of the capelin in our samples was 18.8 cm.

Table 1

Length and weight of spawning capelin according to age and sex

Sex	Males						Females					
	Length, cm			Weight, g			Length, cm			Weight, g		
Age	min.	max.	av.	min.	max.	av.	min.	max.	av.	min.	max.	av.
2	13.4	14.1	13.7	13.0	16.5	14.9	12.1	14.3	12.5	8.0	16.5	12.0
3	13.6	17.0	15.2	15.5	27.0	21.0	13.5	16.2	15.1	12.5	25.0	19.7
4	16.3	18.8	16.9	27.5	39.5	29.9						

The smallest weight was 8.0 g, while the greatest was 39.5 g. We observe an increase in the length and weight of the capelin with age (Table 1).

The spawning population of capelin was represented by three age groups. In the runs three-year old fish predominated (Table 2). The youngest fish were two-year old capelin, and no fish older than four years

Table 2.

Age composition of the capelin in the Sea of Okhotsk (as %)

Age	%	Number of specimens
2	20.4	122
3	72.4	435
4	7.2	43

were encountered during the period of our observations. Among the young fish females predominated, while males predominated among the older fish. The capelin first attains sexual maturity at the age of two years, while mass maturation occurs at the age of three years. The females mature earlier than the males.

According to the data of V. S. Prokhorov (1965), there exists a close relationship between the dimensions of the capelin and its otolith. This means that the otoliths are useful for carrying out reciprocal calculations.

The average lengths according to the age groups did not show pronounced differences in the growth of the males and of the females (Table 3). The linear growth in the capelin, which is high in the first two years, decreases with age.

Table 3

Average length of capelin of different age groups (according to the data of the reciprocal calculation)

	Males			Females		
Age group	range	average length, cm	number of specimens	range	average length, cm	number of specimens
1	4.8 - 6.4	5.3	50	4.0 - 6.2	5.2	50
2	10.3 - 12.9	11.4	50	9.2 - 12.2	11.1	50
3	13.7 - 16.5	15.4	50	13.5 - 16.4	14.9	50

The gonads of the capelin are asymmetrical. In the males the left testis is more strongly developed, while in the females the left ovary is likewise more strongly developed.

The absolute fecundity, counted in 10 females, ranged from 10,666 to 16,080 eggs, with an average of 12,754. With an increase in the length and weight of a capelin its fecundity increases.

According to the data of N. C. Fadeev (1970), the fecundity of the capelin in the south-eastern part of the Bering Sea ranges within limits of from 9.8 to 29.3 thousand eggs. According to A. I. Rumyantsev (1946), the fecundity of the capelin in the Sea of Japan ranges from 15.3 to 39.9 thousand eggs, i.e. it is greater than in the Bering Sea and the Sea of Okhotsk.

The benthic eggs are stuck to grains of sand and gravel. The diameter of the eggs ranges from 0.80 to 1.10 mm, with an average of 0.93 mm. Most frequently encountered are eggs with a diameter of 0.85 - 0.95 mm (in all cases). The graphed curve of the egg dimensions has a single peak, which is indicative of a once only spawning of the capelin. Drawing attention to itself is the fact that the dimensions of the eggs in different individuals are within the very same limits. This is indicative of a brevity of the spawning periods (Figure 1).

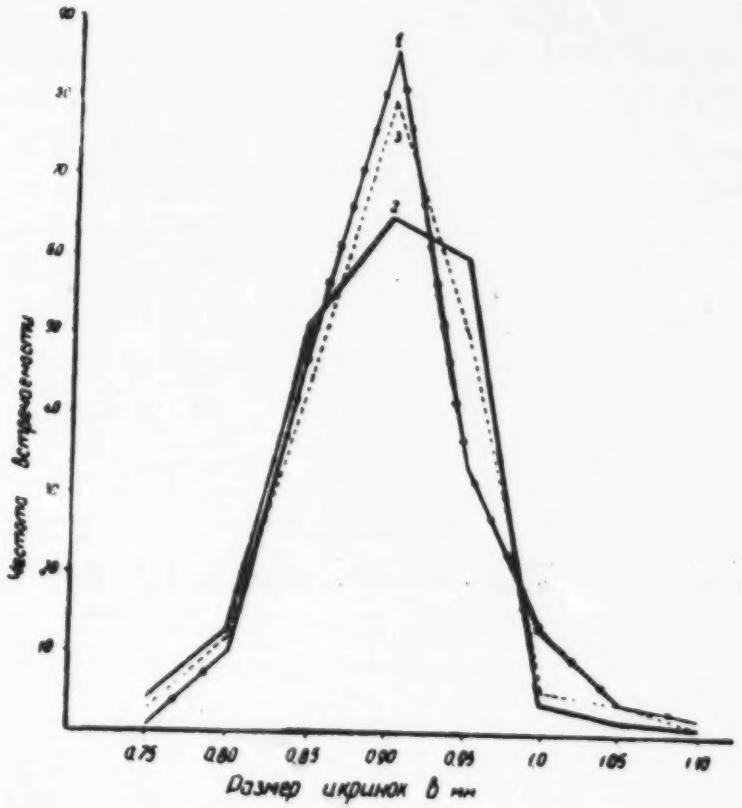

Рис. 1. Размер икринок мойвы (l = 15,3; 15,0; 15,2 см)

Figure 1. Dimensions of capelin eggs (l = 14.3, 15.0, 15.2 cm)

Ordinate - Frequency of occurrence

Abscissa - Dimensions of eggs in mm.

The spawning of the capelin, commencing on May 28th and terminating on June 25th, was observed during the daylight period, in the surf zone, at a depth of from 1 to 3 - 4 m. The average daily temperature ranged from 4.6 to 8.8°. The capelin moved in a dense band and were thrown up by the waves onto the shore. The spawning grounds are not protected from the waves, and surf is observed here even in calm weather. In the male, during the period of spawning, there appears a nuptial dress: ridges along the sides of the body from hair-like outgrowths of the scales, while the anal fin becomes hard and fan-shaped.

Our data, on the spawning location of the capelin, the depth and the diameter of the eggs, are in accordance with the data of A. I. Rumyantsev (1946).

The question of the intensity of feeding of the capelin during the spawning period is one of the controversial questions in its biology. In the opinion of N. S. Khokhlina (1957) the feeding of the capelin comes to a complete stop during the spawning period, while in the opinion of G. V. Boldovskii (1936) and V. S. Prokhorov (1965) it only diminishes.

The capelin in the Sea of Okhotsk feeds weakly during its spawning period, mainly on the eggs of individuals of its own species, on mysids and euphasiids.

The fatness condition factor ranged from 0.53 to 0.84, with an average of 0.67. The condition factor of the males was greater than the condition factor of the females. With age we find an increase in the condition factor of the capelin (Table 4).

Table 4.

Condition of the capelin (according to Clark)

Sex	Number of specimens	Age			
		2	3	4	Average
Males	372	0.79	0.81	0.84	0.81
Females	128	0.53	0.57	-	0.55
Both sexes	500	0.66	0.69	0.84	0.67

As a commercial fish the capelin is utilized only during the spawning period. It is caught in trap nets. On the west coast of Kamchatka the Krutogorovskii, Kirovskii and Oktyabr'skii fishery combines catch capelin. It may be assumed, however, that its stocks in the Sea of Okhotsk are not being adequately utilized. The amount of capelin caught during the spawning period depends on the resources for processing and treatment.

The capelin has a very pleasant taste and may be utilized for the preparation of a fairly wide assortment of culinary dishes.

The study of the capelin in the Sea of Okhotsk and the Bering Sea will be continued during other periods of its life. With the accumulation of biostatistical information over a period of several years it will

become possible to form a judgement concerning the population dynamics of the capelin and to provide a valid basis for a rational magnitude of its catch.

Conclusions

1. The length of the caught capelin ranged from 12.2 to 18.8 cm, while the weight ranged from 8 to 39.5 g. An increase in the length and weight of the capelin is found with age.

2. The spawning population of capelin is represented by three age groups. Three-year old fish predominate in the nets.

3. The capelin first attain sexual maturity at an age of two years, while mass maturation occurs at 3 years.

4. The absolute fecundity ranges from 10,666 to 16,080 eggs, with an average of 12,754 eggs.

5. The diameter of the eggs varies within the limits of 0.80 - 1.10 mm, with an average of 0.93 mm. Spawning is one-time.

6. The fatness condition factor ranges from 0.53 to 0.84, with an average of 0.67. An increase in the condition factor is found with age.

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CERTAIN DATA ON THE BIOLOGY OF THE CAPELIN (MALLOTUS VILLOSUS O. F. MILLER) OF THE WEST COAST OF KAMCHATKA

E. A. Savicheva

SUMMARY

An investigation of the biology of the capelin during spawning was undertaken for the first time. The fish have been characterized with respect to size, weight and age. The body length and weight of Capelin increase with age. The spawning population is represented by 3 age classes, 3-year-old fishes being dominant. Initial maturity is attained by 2-year-olds who spawn singly.